DOCUMENT RESUME

ED 138 548 95 SP 010 961

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TITLE Review of the Literature on Team-Teaching in Mathematics. Teacher Corps Mathematics Work/Study Team. Working Paper No. 3.
INSTITUTION Stanford Univ., Calif.
SPONS AGENCY Office of Education (DHEW), Washington, D.C. Teacher Corps.
PUB DATE Nov 75
NOTE 16p.; For related document, see SP 010 959

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS Abstracts; *Academic Achievement; *Classroom Research; *Elementary School Mathematics; Elementary Secondary Education; *Literature Reviews; *Mathematics Instruction; *Secondary School Mathematics; Student Attitudes; Teacher Attitudes; *Team Teaching

ABSTRACT

This document is a collection of abstracts of research studies on team teaching in mathematics. The research reviewed for this paper revealed little difference between team teaching and traditional instruction. Some trends suggested by the literature review are summarized according to grade level--elementary, junior high, or post-junior high. The majority of available research dealt with elementary school students. When studies indicated significant differences in pupil achievement, the traditional classroom was favored. In studies that investigated attitudes, teachers were found to prefer team-teaching. In the junior high setting, it was found that traditionally taught pupils performed significantly better than team-taught pupils in one study, and no significant differences were found in other studies. It was discovered that students preferred the traditional classroom, although evidence also suggested that team-teaching improved the self-concept of some pupils. Only one study involved education beyond the junior high level--in a college algebra course, no significant difference was found between traditional and team teaching. (MM)

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ED138548

November, 1975

Teacher Corps Mathematics Work/Study Team
Working Paper No. 3

Review of the Literature on Team-Teaching in Mathematics

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INTRODUCTION

There is little research available dealing specifically with the team-teaching of mathematics, and that which is available is not very informative. One of the basic difficulties lies in the definition of team-teaching. The term is often defined very vaguely, e. g. "cooperative planning by teachers", or "small and large group instruction", or "flexible scheduling". When team-teaching is well-defined, it is different from study to study. These factors, considered together with the generally poor designs of the studies, do not provide a strong direction for continued research or firm guidelines for the development of a team-teaching program in mathematics.

In spite of the drawbacks, the literature reviewed did suggest some trends. In the following paragraphs, these trends will be discussed according to grade level: elementary, junior high, and post junior high.

REVIEW OF THE LITERATURE

Elementary

The majority of available research in the team-teaching of mathematics dealt with elementary school students (K-6). Bair (1963) evaluated a five-year program on the research and development of team-teaching, and was the only researcher to report strong evidence favoring that type of teaching. The evaluation was made on the basis of pupil achievement and adjustment, and parent and teacher attitudes.

When studies indicated significant differences in pupil achievement, the "traditional" classroom was favored. Burchyett (1972), Crandell (1966),

* The literature was reviewed with the assistance of the doctoral students in the Mathematics Education Program at Stanford.

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and Rhodes (1971) found that when several subjects were taught, pupils in traditional (self-contained) classrooms scored higher than those in a team-teaching situation, but only in one of the subjects: math, reading, or social studies. Lambert, et al (1965) found no achievement differences between the two instructional methods.

In studies that investigated attitude, teachers were found to prefer team-teaching (Crandell (1966), Rhodes (1971)), while students in most cases preferred the self-contained classroom (Crandell (1966), Rhodes (1971), and Schmidt (1971)).

Junior Hi

In t anior high school setting (7-9), Noto (1972) found that traditionally taught pupils performed significantly better than team-taught pupils in all five of the subject areas tested. Napier (1970), Paige (1966), Thompson (1972), and Zander (1973) discovered no significant differences in academic achievement between the two methods.

Paige (1966) found that students preferred the traditional classroom, while Thompson (1972) found that team-teaching improved the self-concept of some pupils.

Stevenson (1966) investigated flexible scheduling i. e. regrouping students at the beginning of a new unit on the basis of a pretest. The results of this study indicated that flexible scheduling makes no difference in computation or application of arithmetic, but does improve the understanding of arithmetic concepts.

Post Junior High

Only one study involved education beyond the junior high level. Arcidiacono (1970) investigated team-teaching versus traditional instruction in a college algebra course and found no significant differences between the two.

SUMMARY

In terms of academic achievement, the research reviewed for this paper showed little difference between team-teaching and traditional instruction. Where there were differences, traditional instruction was favored in most cases.

In terms of attitude, teachers tended to prefer team-teaching, while students tended to like the traditional classroom.

Arcidiacono, Michael. A Comparison of the Effects of a Team Teaching Method, Involving Prospective Student Teachers, and a Lecture Method on the Achievement and Attitudes of College Intermediate Algebra Students. Unpublished doctoral dissertation, University of Oregon, 1970. 71-10, 687.

Population:

Four classes of college intermediate Algebra. The two experimental classes were conducted in the winter and the control were taught in the spring.

Treatment:

The purpose of the study was to compare the effectiveness of team teaching (the experimental method) with the lecture approach (the control method).

Team teaching combined large and small group instruction in a non-lecture setting. Large group instruction was used to introduce each unit and also for testing. On the bases of observations and test performance, experimental group students were divided into two groups to concentrate on more homogenious needs.

The team consisted of the instructor andthree assistants who were preparing to do student teaching in math at high school.

Results:

All students took the CEEB Math Level I Achievement Test the first day of class. Posttest measures included an achievement test constructed by the experimenter and tow Semantic Differential attitude scales. One attitude scale examined Math attitudes and the other addressed intermediate algebra attitudes.

There were no differences on the pretest. Also, no significant differences were found on any of the posttest measures.

Bair, Medill, Woodward, Richard G. Team Teaching In Action. Houghton Mifflin Company. 373.13 B163

Purpose:

The review of a five year program of research and development of team teaching. The Lexington Team Teaching Program (LTTP) came into being in 1957 in the schools of Lexington, Massachusetts with arrangements with School and University Program for Research and Development (SUPRAD), consultation from Harvard, and a grant from the Ford Foundation.

Population.

Elementary students grades 1-6 in two schools.

Treatment:

The organization and development of team teaching in elementary schools. Problems examined in the development included

1. Team planning and evaluation
2. Grouping criteria
3. Communication
4. Recruitment and role description
5. Scheduling practices
6. Supplies
7. Establishing a team
8. Teacher specialization
9. Foundation supported research

Results:

Results included academic achievement, pupil adjustment, parent opinion, and the impact on teachers. Achievement resulted from performance tests, parent opinions were collected through questionnaires, and pupil adjustment and impact on teachers were obtained from interviews.

In a summary report in 1959, the general statement was made that "no serious harm" resulted from the project. Although this was an attempt to present the findings in a conservative ~~manor~~, it does reflect the lack of statistical findings.

The 1962-1963 report was much more complete and showed that the cummulative results after five years of the project favored team teaching. Results of the SAT given to pupils in team teaching and conventional classes showed that in all but 9 of 48 tests, average or better than average gains were made by team teaching pupils. Pupil adjustment evidence was not conclusive but was generally favorable. Parent opinions favored team teaching in 4 out of 5 responses. Impact on teachers showed increased willingness to innovate, to specialize, to share, to observe, to be observed, and to evaluate.

The outstanding aspect of this program was its longitudinal nature. Although the results of the first and second years were inconclusive, the fifth year results showed positive evidence favoring team teaching.

Burchyett, J. A. A comparison of the effects of nongraded, multi-age, team teaching vs. the modified self-contained classroom at the elementary school level. (Doctoral dissertation, Michigan State University) University Microfilms: Ann Arbor, Mich., 1972. No. 73-12686.

POPULATION: Students from grades 3, 4, and 5 in Grand Blanc, Michigan. Experimental group had 332 Ss and Control group had 203 Ss.

TREATMENT: Experimental Group received instruction in a nongraded, multi-age, team teaching classroom. Control Group received instruction in a self-contained classroom.
Nongraded: A method of grouping Ss for instruction in which grade labels are not applied to Ss; instruction is given on an individual basis to Ss from a wide range of ages and abilities.
Multi-Age: An organizational pattern os assigning Ss for instructional purposes with a chronological age range of 2 to 3 years.
Team Teaching: The sharing in planning and conducting instruction offered to the same group of Ss by 2 or more teachers.
Self-Contained Classroom: A classroom in which one teacher instructs all the subjects, with the exception of such specializations as art, music, and physical education.

RESULTS: Ss in self-contained classroom excelled in math at 4th grade level and in social studies at 5th grade level. In all other academic areas there was no difference in the achievement of students.

Lambert, P., Goodwin, W.L., Roberts,R.F., Wiersma, W.; A Comparison of Pupil Achievement in Team and Self-Contained Organizations; Journal of Experimental Education, (Vol 33, #3, Spring 1965).

POPULATION: This was a two year study which included 299 elementary students the first year and 381 elementary students the second year.
Two schools were involved in the study. Washington School - 60%
Longfellow School - 40%
Both schools were from an economically depressed area of the city.
25% of the subject's families received aid under Public Assistance Program.
60-70 % of the subjects fathers worked in unskilled or semi-skilled occupations.

TREATMENT: No details of treatment were spelled out.
All that is mentioned is that Washington school had both team and self contained classes. Students were randomly assigned to one or the other.
Longfellow school, the control school, had only self contained classes.
The only details about the functioning of the team were:
There were two multigraded teams - a primary team for grade 1 to 3
an intermediate team for 4 to 6.
The team was made up of five members: leader, regular teacher, two graduate teacher interns, ½ time instructional secretary.
Cost per five member team was estimated at three times the cost of one regular teacher.
No details of how the team teaching differed from the self-contained teaching are included in the paper.

RESULTS: Conclusions were based on test results obtained from
California Achievement Test (pre-&post tests; 2nd to 6th graders).
Iowa Test of Basic Skills
California Short Form Test of Mental Maturity

This study does not demonstrate that the team structure leads to significantly better achievement, but it does suggest that such improvement might come by continuing development of the team concept.

Lindgren, R. F. A comparison of team learning with learning through conventional teaching as methods in teaching arithmetic reasoning in grades four and five. Unpublished doctoral dissertation, University of Connecticut, 1965.

Population: Five fourth grade classes and four fifth grade classes from a public school; N = 219.

Treatment: Two fifteen-week periods were used to provide all classes, except the control one, with both the conventional and team learning methods. Pupils in the latter classes were assigned to teams (based on past arithmetic performance and teacher judgment) of two or three members, and were given job sheets to guide them through the text according to their own learning rate. Workshop sessions on team learning for teachers were held before and during the experiment. Arithmetic reasoning achievement growth was measured; pupils were classified into intellectual sub-groups for analysis.

Results: 1. Fourth graders in the experimental group made a significantly greater gain in achievement growth than fifth graders in the experimental group.

2. Pupils who had employed team learning during the first period and conventional teaching during the second period made a significantly greater gain in achievement growth during the period of team learning.

Crandell, E. W. An experimental study: team teaching compared with the self-contained classroom organization in upper elementary school grades. Unpublished doctoral dissertation, Wayne State University, 1966.

Population: Seventy-two pupils matched on grade level (fourth, fifth, and sixth), I.Q. level (high, average, and low), sex, and school (two experimental and two control); a team of two teachers at each grade level in the experimental schools, eighteen as control group teachers.

Treatment: Under the team teaching plan, the major curricular areas were divided into two blocks (language arts--social studies and science--mathematics), and each of the two team teachers taught one of the blocks. The two team teachers were responsible for planning the instructional program.

Results: 1. Students in self-contained classrooms did significantly better than those assigned to team teaching classes in arithmetic reasoning, concepts, and computation.

2. Teachers in general favored the team teaching idea, while pupils favored the self-contained classroom organization.

Napier, Toy Lee. A Comparison of a Team and a Non-Team Method of Teaching Algebra I to Ninth Grade Students who were Low Achievers in Eighth Grade Mathematics; Unpublished doctoral dissertation, University of Arkansas, 1970.

POPULATION: Forty ninth grade junior high school students in Springdale, Arkansas (1968,69) identified as low achievers in eighth grade mathematics.

TREATMENT:

All students were taught the same special section of Algebra I.

Control group- eleven girls, nine boys, assigned to two classes, A and B.
Class A taught by teacher A.
Class B taught by teacher B.

Experimental group- eleven girls, nine boys, team-taught, as one group, by teachers A and B above.

Lesson structures -

Control group- ..short review question-answer period.
..introduction of new material (20-30 min.)lecture.
..assignments and individual work.
..short tests (1 or 2 times per week)
longer tests every 9 weeks.

Experimental group- class size, double size of control group.
..30-50 minute lecture, once or twice a week by teacher A or B. Teachers shared lecture duties; pre-planned together for special skills and interests).
..Group assignments (problems to work)
..Small group discussions - independently, or with instructor.
..Independent work.
Two rooms available; one for discussion, one for individual study.
..Tests (short) for students to evaluate own progress.

Test Data - same data for both groups.

Standardized tests:	California Contemporary Math Test
	California Study Methods Survey
	California Survey Test of Algebraic Aptitude
Non-Standardized	Teacher-made final examination.

RESULTS: No significant differences were found between the two groups of students taught Algebra I by traditional vs. team-teaching method in

1. mechanics of study
2. ability to plan and apply systematic thought to study.
3. attitude toward school
4. algebraic achievement as measured by a standardized algebra test.
5. algebraic achievement, as measured by a teacher-made algebra test.
6. arithmetic achievement

The authors recommended that a larger study was indicated in order to cover students of wider ability levels than those included in this study.

Noto, Edward R. A Comparison Between Traditional Teaching and Interdisciplinary Team Teaching at the Seventh Grade Level Dissertation St. Louis University 1972

Population: 400 seventh grade students at two St. Louis junior high schools. Above average social-economic-status students.

Treatment: 178 students at one school in a traditional program were used as a control group. 222 students in the other school were taught in a team teaching set up. This included large-small group instruction and discussion of non-academic subjects.

Results: Traditionally taught students scored significantly better on all five subtests of the Iowa Test of Basic Skills than did the experimental group. On a retest the following year, the students who had been in the traditional group again scored significantly better on all but the reading subtest. Analysis of covariance was used in all the hypothesis testing.

Paige, D. D. A comparison of team versus traditional teac hing of junior high school mathematics. Unpublished doctoral dissertation, Indiana Univeristy, 1966.

Population:

92 seventh graders
76 eighth graders

Treatment:

Control Group
- one teacher per class
- 30 Ss per class
- "traditional" teaching

Team Teaching Group
- three teachers per class
- 90 Ss per class
- large group instruction, small group instruction, independent study, student work groups

Both Groups
- student teachers
- same audio-visual techniques
- common planning periods for teachers of each group
- same topics
- time: one semester

Results:

no significant differences in achievement
no significant differences in retention over the summer
ability to relearn the same topics the following year was not significantly different
perhaps team-teaching is more effective for eighth grade than for seventh grade
eighth graders felt that they received more individual help in a team teaching situation, but that they learned more in a traditional classroom
seventh and eighth graders felt that team teaching lowers the popularity of the course

Rhodes, Fen. "Team Teaching Compared With Traditional Instruction In Grades Kindergarten Through Six" in Journal of Educational Psychology, Vol. 62, No.2, April 1971, Pp.110-116.

Population: One-fourth of the pupils in each classroom of the team and control schools were selected at random for the comparison study. 316 pupils ingrades K-6were selected. 138 pupils were taught in traditional classes, 147 were in team taught classes, and 31 pupils were enrolled in self-contained classes operated at the team school. The schools were located in a suburb of Los Angeles.

Treatment: At both, team and control schools, fifth and sixth graders spent one-half of each day learning basic skills subjects. The other half of the day was devoted to foreign language, social studies, science, art, music, and physical education. These subjects were taught by pairs of resource teachers, supplemented by district-wide instructional television.

Instructional teams in grades 1-6 were composed of three teachers, the kindergarten team of two. In each team one teacher was designated as leader. Pupils were seated in separate groups of 30 and instructed by one team member, who had primary academic and record-keeping responsibilities for these students.

Two teacher aides were employed at the team school. one for grades K-3 and the other for grades 4-6. These aides performed clerical tasks and assisted in developing special curriculum materials.

The team school had an active parent organization whose members devoted much time and effort to the preparation of classroom materials requested by teachers.

The control school had one teacher aide to assist the resource teachers in grades 5 and 6.

Results: The mean improvement and ANOVA for academic achievement and pupil attitude for team versus traditional instruction appear in tables one and two below.

TABLE 1

MEAN IMPROVEMENT IN ACADEMIC ACHIEVEMENT AND PUPIL ATTITUDE UNDER TEAM VERSUS TRADITIONAL INSTRUCTION

Area	Grades K-6[a]			Grades 1-6[b]		
	Team	Non-team	Diff.	Team	Non-team	Diff.
Reading[c]	14.3	17.6	−3.3**	18.4	19.3	−3.9**
Spelling[c]	11.5	12.6	−2.1	11.7	12.6	−0.9
Arithmetic[c]	11.0	12.3	−1.7	10.1	11.2	−1.1
Pupil attitude[d]	−0.3	0.0	−0.3*	−0.2	−0.1	−0.1

[a] Team versus control school—unadjusted means (excludes self-contained classes in team school).
[b] Team-taught versus self-contained classes within team school—adjusted means (except pupil attitude).
[c] Expressed in months of achievement (10 months = 1 school year).
[d] Expressed on 5-point scale reflecting favorability of attitude toward school and learning.
* $p < .05$.
** $p < .01$.

In no case was team teaching superior to traditional classroom instruction and it was significantly worse with respect to average reading gain($p<.01$) and to some extent, degree of improvement in pupil attitude($p < .05$) .

Teachers of team-taught classes were more positive ($p< .05$) in their job attitude than teachers at the control school.

TABLE 2

SUMMARY OF ANALYSES OF VARIANCE FOR PUPIL MEASURES: TEAM VERSUS CONTROL SCHOOL (GRADES K-6)

Source	df	F—Initial level					F—Improvement			
		IQ	Reading achievement	Spelling achievement	Arithmetic achievement	Attitude	Reading achievement	Spelling achievement	Arithmetic achievement	Attitude
Teaching mode (A)	1/271	.01	.72	1.08	3.08	.57	12.69**	1.76	1.23	4.59*
Grade level (B)	6/271	4.39**	248.74**	302.55**	349.69**	2.20	31.59**	23.85**	6.99**	2.63*
A × B	6/271	1.81	1.01	.89	1.58	1.35	2.42*	1.78	.38	3.79**

Note.—Self-contained classes in team school excluded from above analyses.

* $p < .05$.

** $p < .01$.

Parents of children attending the team school were found to be equally favorable in their opinion of school effectiveness as parents of children attending the control school.

There was no significant AB interaction for reading improvement within the team school. Only at the third grade level did self-contained classes fail to improve substantially more than the team classes(grades 1-4).

Schmidt, Linda and June Gallessich. "Adjustment of Anglo-American and Mexican American Pupils In Self-Contained Classrooms and Team Teaching Classrooms." Journal of Educational Psychology. Vol.62. No.4. Pp.328-332. 1971

Population: 160 first graders
382 sixth graders
These students came from four schools in Texas. They were described as:(1) team teaching - Anglo American students (2) team teaching - Mexican American students (3) self contained class - Anglo American students (4) self contained class - Mexican American students

Treatment: A test of anxiety* and of pupil perception of the teacher** were given to all students and were used as a measure of pupil adjustment.

Results: I will report only statistically significant results.

Anxiety —
(1) Mexican American scores higher.
(2) Self-contained higher than team teaching.
(3)6th grade females higher than 6th grade males.
(4) Mexican American sixth graders in self-contained classes were higher than Mexican American sixth graders in team teaching classes.

Pupil Perception of Teacher —
(5) Sixth grade students in self contained classes were more favorable than sixth grade students in team teaching classes. ($p<.0001$)
(6) 6th grade girls more favorable than 6th grade boys. ($p<.001$)
(7) Anglo American sixth graders in self contained classes were more favorable than Anglo American 6th graders in team teaching classes. ($p<.00001$)

* Grade 1 used the Picture Anxiety Test.
Grade 6 used the Phillips Anxiety Test.
**Grade 1 used the primary form } Pupil Observation Survey
Grade 6 used the intermediate form } Report

Stevenson, R. L. The achievement gains in mathematics of seventh grade pupils when achievement grouping and flexible scheduling are employed in a team teaching program. (Doctoral dissertation, New York University) University Microfilms: Ann Arbor, Mich., 1966. No. 67-4911.

POPULATION: 142 seventh graders from Mountain Lakes, New Jersey.

TREATMENT: The mathematics course of study employed in this investigation was divided into ten units of study during one academic year: (1) Natural Numbers and Equations, (2) Graphs, (3) Factors and Primes, (4) Rational Numbers: Fractions, (5) Rational Numbers: Decimal Fractions, (6) Negative Numbers, (7) Systems of Numeration, (8) Sets, (9) Geometry, (10) Rational Numbers: Per Cents.

At the beginning of each unit of study, the Ss were given a diagnostic test to determine the Ss specific skills, concepts, and understandings of the material to be studied. Upon analysis of the diagnostic tests, the Ss were grouped into three levels of enriched, reinforced, or basic. By using flexible scheduling, the Ss were given the opportunity to change group levels at the beginning of each unit of study.

RESULTS: On the average, 44% of the Ss changed group levels at the beginning of each new unit of study. There was no significant difference between the achievement gains of Ss who changed group levels three or more times and the achievement gains of Ss who changed group levels two or less times for the measures of arithmetic computation and arithmetic applications. For the measure of arithmetic concepts, however, the Ss who changed group levels two or less times demonstrated significantly higher gains than the Ss who changed group levels three or more times.

Total achievement gains were related more to the group level placement of the Ss than to the mathematical ability of the Ss. For some Ss, assignment to the enriched group may have produced more academic motivation than assignment to the other group levels.

1.) Zander, Betty Jo Jackson. Junior High Students View Themselves as Learners: A Comparison among Eighth Grade Students. (University of Minnesota, 1973)

64 8th graders in "team" classrooms, 51 in "non-team" classrooms, and 70 contrast students

Team teaching meant simply four subject matter teachers conferring and working together, still used separate although adjacent rooms.

Non-experimental, ex-post-facto design. Used 3 self-concept measures and two achievement measures.

There were no significant differences with respect to team teaching.

2.) Thompson, Jack Smith. Longitudinal Study of Student Self-concept and Academic Achievement. (Utah State University, 1972)

Tested students in grades 4, 6, and 9. The experimental group had team teaching in grades 4-6 but reverted back to traditional teaching in grades 7-9. The number of experimental students varied from 92 down to 71. The control group only had traditional teaching and the numbers varied from 51 down to 34.

Team teaching was not described other than to say it meant the "joint responsibility" of two or more teachers for a batch of students.

Wanted to specifically study the effects from reverting back to a traditional setting from team teaching.

There were no significant differences with respect to achievement.

Self-concept for students in grades 4 and 9 (end of year testing) was better for the experimental group.